MUNICIPAL LIGHTING RATES

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INTRODUCTION

For many years most cities in the United States have been trying to solve individually problems relating to their local lighting rates without proper knowledge and investigation of the subjects to find out what benefits have been accomplished by other cities under similar local conditions. In other words, there has been a lack of coöperation on the part of our municipalities in dealing with light rate problems. Too little publicity has been given low rate settlements made by utility corporations with cities.

The results of this failure of municipalities to work closer together for fair and reasonable rates are clearly shown by the high kilowatt hour rates, or yearly arc lamp or tungsten rental rates paid by certain cities as compared with low rates in vogue in other cities under similar local cost conditions.

In comparing the relative public street lighting rates, let me ask you, gentlemen:

(a) What are the cities which you represent paying for public street lighting? Are you purchasing electrical energy and maintaining the lights by city labor (trimmers and patrolmen, etc.) or are you contracting with utility companies for lights on a yearly basis?

Perhaps your rates are high because no thorough investigation was ever made of cash costs and fixed charges upon the actual valuation of the utility property supplying the service so that excess charges are made which are not fair or reasonable to the public.

(b) It is well to ask: What do these rates mean in terms of the relative quantity and quality of lighting? In other words, under your local conditions, is your city getting economical rates and efficient service from the utility companies which furnish energy or contract to supply service?

This convention's slogan should be "Economical rates and efficient service from all sources."

A low rate does not necessarily mean an economical rate, as the service rendered may be poor. Municipalities must demand efficient service at economical rates. Economical rates can be appropriately defined as those which are fair and reasonable to the producer (utility company) and the consumer (the public).

(c) What are the reasons that a city under similar local physical construction and operating conditions has higher rates than other cities of the same size?

In the first place high rates are many times the result of bad politics or a lack of knowledge on the part of members of the council who approve of contract ordinances or yearly contracts allowing high rates. Public utility companies in one city may have more political influence than in another, resulting in the passing of unsatisfactory rate measures, involving the giving away of rights which should remain with the city.

A city may have little appropriated for rate investigations when the contract lighting rate ordinance has expired, resulting in an unfair and unreasonable contract which is based only on a preliminary report by a city official who is either incompetent to report upon such a technical subject, or who is influenced in different ways to favor the utility corporations in his report, while another city obtains a fair and reasonable rate ordinance by the city council through its committees coöperating with a competent expert in carrying on a thorough rate investigation after a proper valuation of a utility property is known.

The refusal or procrastination of a utility company to open frankly their books or to coöperate with the expert making the investigation delays a satisfactory settlement which results in unnecessarily high expense for all concerned.

In the second place, the union labor scale of wages, which is materially higher in some of our cities than in others of the same size, will naturally increase the telephone, gas, lighting or other municipal rates in these cities.

The two principal factors discouraging municipal ownership of public utilities in our cities today are bad politics and the relatively high union scales paid municipal labor to that of the low scales paid utility corporation labor for the same class of work. When we eliminate the results of bad politics by non-partisanship elections and establish and regulate a fair living scale of wages in all classes

of labor, the municipality will be placed on the same operating cost basis of utility service as the corporations with the advantages of low interest charges on the investment. Until such time that this is accomplished municipal ownership will seldom be economical or practical for the public taxpayer.

The object of this paper is to place before this conference facts concerning: first, the principal factors entering into municipal street lighting costs; second, how far Chicago has studied these factors in order to solve its street lighting problems on an efficient and economical basis; and third, what steps are necessary to utilize all good rate-regulation work and improvements which have been accomplished in various cities.

STREET LIGHTING COST FACTORS

The principal economical factors to be considered in establishing the kind, quality, type and quantity of public street lighting in every city are:

Kind of Lighting

(A) Resources of lighting elements.

(a) Can electricity be generated or purchased cheaply due to nearby water power or low priced coal and labor?

(b) Is natural or artificial gas relatively cheaper for lighting purposes due to location near gas or coal fields?

Franchises:

(B) Does the gas company franchise give more to the city than the electric company franchise, such as requiring the extending of gas services free of cost to the city for public street lighting and by not specifically allowing the city to use free of cost the electric company conduits and poles for municipal street lighting?

Local Physical Conditions:

(C) The physical installation conditions of a city should materially enter into the economical solution of kind of lighting problem. The relative fixed charges on gas service installation in rock formation would ordinarily be less economical than those upon an overhead arc or incandescent electric lighting installation in the same district.

Low candle power incandescent gas or electric units are generally considered a more practical kind of lighting in a heavily wooded residence district than a flaming arc lamp installation, while the

flaming arc, magnetite, or the high candle power nitrogen tungsten lamp is the only kinds to be considered for large open business street areas.

Scale of Wages:

(D) If the union electrical workers' scale of wages is high in a city it is most likely that more economical lighting can be obtained by contracting the maintenance and operation of electric or gas lamps where the contractor would employ non-union men.

Quality of Lighting

The citizens of one city may demand and their municipal authorities agree to supply a high degree of illumination on congested thoroughfares or a more uniform distribution of lighting units, including the lighting of all alleys, while another city which is satisfied with much less illumination may establish a policy to appropriate proportionately more for policing their streets than lighting them. The solution of this economic problem of the protection to our citizens should be gradually brought about by bettering the "Quality of Lighting" in each city, thereby aiding the present police force rather than by appropriating proportionately more for additional policemen.

Type of Lights

There is little choice between the various standard makes of gas mantles, the gasoline or the tungsten electric lamps, as they have been standardized by the manufacturers and in general give equal efficiencies. It is quite different with arc lamps. During recent years the magnetite and flaming carbon arc lamps have replaced many old inefficient open and enclosed arc lamps in the different cities. Today the large gas-filled tungsten lamps are strong competitors of the modern arcs.

The choice of the type of lamp for each city should be made on the lamp's merits after a thorough study and test of all the different kinds of lamps, suitable for the local conditions, have been completed, including proper height and spacing of lamps. The following characteristics should be considered in fixing the relative merits of the arc lamp: Total light flux, light distribution, light constancy (flicker, etc.), light efficiency, mechanical efficiency, regulation, power factor, accessibility, design, materials, reliability in service and carbon consumption.

The relative merits can be fixed more exactly by assigning a value to the above qualities which would represent the quantitative relation of each particular quality to the sum of all qualities.

Quantity of Lights

The economical quantity of gas, gasoline, tungsten or arc lamps which is to be distributed in any residence or business area of a city should depend largely upon the relation of the total amount appropriated for the installation to that of the uniform quality of the lighting throughout the city.

Philadelphia's 1913 annual lighting cost of $2,390,069 (when figured on the same basis as most cities), allows proper lighting of alleys, while Chicago could not light the alleys out of the 1913 appropriation of only $1,493,250 for public street lighting. It costs Philadelphia $776 a year to light many of its business corners where eight lamps at a unit cost of $97 per year are installed, while it costs Chicago but $156 for the lighting of its best lighted corners, that is, two flaming arcs at $78 per arc on underground construction, which includes maintenance, operation and fixed charges.

A system of rules for the economic distribution of the various kinds of lights in a city should be established and adhered to closely. These standardizing rules would be based upon a proper engineering layout and estimate to cover the entire city, taking into consideration the relation of the following factors: Kind, quality, type and quantity of lights to the available appropriations for the rental or installation and annual maintenance costs.

What has Chicago done to solve economically her street lighting problem? Chicago, with a population of 2,368,672, area of 194 square miles, and with 4,525 miles of streets and alleys, paid $325 per mile of street and alley for lighting during the year 1913.

1913 Annual Lighting Cost Statistics

	Miles of Streets and Alleys	Total Expenditure for Public Street Lighting	Annual Cost Per Mile of Streets and Alleys	Per Cent Relative to that of Chicago
Chicago	4525	$1,473,127.00	$325.00	100
New York*	3247	3,346,306.00	1030.00	317*
Philadelphia	1770	2,390,069.00†	1350.00	415
Boston*	568	768,779.00	1353.00	416*

* 1912 figures.

† Cost when figured on the basis of most cities.

There were 40,136 street lamps in service in Chicago on January 1 of this year, 38,240 being the average throughout the year, as is shown below:

			For the year 1913
15930—450-watt, municipal arcs	@	$56.13	$894,150.90
1772— 80-watt, series tungstens	@	22.62	40,082.64
12769—municipal 50 c.p. gas lamps	@	20.64	263,552.16
907—rented, 450-watt, arcs	@	75.00	68,025.00
6580—rented, 60 c.p. gasoline	@	31.25	205,625.00
282—rented, 20 c.p. tungsten subway lights	@	6.00	1,692.00
38240			
Total			$1,473,127.70

Take the largest item of 15,930 450-watt, municipal arcs at an average of $56.13 as an example of what has been accomplished in Chicago by purchasing electrical energy from the Sanitary District of Chicago (a municipal corporation) and operating a municipally owned distribution lighting system.

The total cost of $56.13 per arc per year consists of $31.32 cash costs and $24.81 fixed charges, which includes interest, depreciation, taxes and rent.

The cash costs of $31.32 per arc lamp per year are made up as follows:

		Per cent of total
Sanitary District power including the operation of sub-stations	$11.44	36.6
Maintenance and repairs of circuits and arc lamps (including trimming and patrolling $7.85), labor	13.25	42.2
Maintenance and repairs of circuits and arc lamps (including carbons $3.91 and globes $.42), materials	6.63	21.2
Totals	$31.32	100.0

It is very evident from the above items that the electrical energy which amounts to 36.6 per cent of the total cash cost is being supplied at a relatively low rate while the operating labor, 42.2 per cent of the total, is relatively high to that of most cities.

The electrical energy is contracted for at $15 per horsepower per year delivered to the sub-stations, which, under our operating conditions, means approximately one-half cent per kilowatt hour.

A high union scale of wages is paid all municipal electrical workers in Chicago, including linemen at $5 per day, arc lamp

trimmers $100 per month and line repairers at $155 per month. A study of these factors which make up the cash costs leads one to believe that there should be no reason for cities contracting with electrical utility companies for 450-watt arc lamps at $90 to $100 per year, unless the fixed charges on the installation more than double that in Chicago, as most public utility employes are not paid as high a scale of wages.

Chicago's investment per arc light on the underground distribution system amounts to approximately $510.80, which is the present estimated cost of installing flame arc lamps in downtown streets, laying 4 duct tile, with laterals for 23 lamps to the mile of street. It includes also, besides the underground construction, repaving, sub-station, post, lamp, complete ready to light up. The present average investment of the Chicago Municipal Lighting System for lamps now operating on underground circuits is $316 per lamp. The investment for the overhead lighting arc system is approximately $215.60 per arc, making an average investment of $256 per arc throughout the system.

I know of no electric utility corporation paying as high a scale of wages as the city of Chicago for operating and maintaining its lighting system, and still there are no cities in the country operating under similar local conditions that contract for anywhere near as low rates, but generally 40 to 50 per cent higher.

The city of Chicago makes yearly contracts with the Commonwealth Edison Company for 450-watt flaming arc lamps at $75 per year for the outlying districts where the lamps are sparsely installed (averaging 500 feet apart) which results in greater investment and higher annual maintenance costs than if spaced an average of 250 feet apart, as are the municipal arcs.

Ten thousand and forty-four of the 17,493 municipal arcs were of the 10 ampere, flaming arc type, 1,261 9.6 ampere, open arcs and the balance of 6,188 being 7 ampere, enclosed carbon arc lamps. The 1,261 open arcs have lately been replaced by 300-watt nitrogen tungsten lamps.

Nitrogen Tungsten vs. Flaming Arcs

About six months ago, after a thorough investigation, we decided to discontinue installing 450-watt flaming arc lamps and to install

in their stead 20 ampere, 300-watt nitrogen tungsten lamps. The favorable results obtained so far from the 1,800 which were installed two months ago lead me to believe that this 300-watt, 600-candle power, nitrogen tungsten lamp, which gives an equivalent illumination to that of the 450-watt flaming arc after the flamer has been in service a short time, is the most economical high power open street illuminant on the market today. When the slagging of the carbons and the etching of the inner globe of the flaming arc are eliminated the arc should be a strong competitor of the nitrogen lamp.

The nitrogen lamps which are purchased under a guarantee of 1,000 hours' life make a more flexible operating system, give a more uniform light and cost less to install and maintain under our Chicago local conditions. It is planned to replace within the next two years the 6,188 7 ampere 450-watt enclosed lamps (giving only about 250 candlepower) with the 300-watt, 600-candlepower nitrogen tungsten lamps, and to extend the system with 5,000 additional lights of this type.

The largest saving in operating the nitrogen lamp under our local labor conditions lies in the trimming and patrolling item.

This saving is brought about by allowing 700 to 800 nitrogen lamps to be kept in repair, cleaned and patrolled by a patrolman who is allowed, besides his salary of $100 per month, $3.75 per day for the expense of an automobile supplied by himself to aid in his work, instead of a trimmer at $100 per month, trimming 330 arcs, and a patrolman at the same wage patrolling 500 arcs, which averages approximately 200 arcs per man for trimming and patrolling, making the relative saving 45 per cent for this item.

Although the cost for four nitrogen tungsten renewals per year (which the manufacturer guarantees not to exceed) is nearly three times the annual cost for flame arc carbons, the relative saving in such items as the cost of power and fixed charges in the nitrogen installation more than offsets this high cost for lamp renewals. It is very probable that the life of these 20 ampere, 300-watt nitrogen lamps will, within a short time, materially exceed the present guaranteed 1,000 hour life, which would result in a still greater saving over that of the flaming arc.

Electric Tungsten Residence Street Lighting

Nearly 100 miles of our best residence streets, which were formerly lighted with 50-candlepower gas lamps, have been relighted during the last two years with an underground, 4 ampere, 80-candlepower series lamp system, at a reduced annual expense per unit.

A large saving was made in this installation by staggering the old gas lamp posts 150 feet apart on each side of the street and wiring them.

Street Subway Lighting

Over 400 street subways running under railway tracks have been lighted by the electrical department during the last 18 months, at an installation cost averaging $10 per 20-candlepower tungsten lamp.

The standard spacing of these lamps averages one per 400 square feet over the roadway, and one per 200 square feet over the sidewalk area, which makes a well lighted subway.

The Commonwealth Edison Company supplies the energy, renews and maintains these lights under a 5-year contract ordinance and allows credit for all outage of the lamps, at $6 per lamp per year.

Contract Lighting Rates

The 5-year contract ordinance which was passed by the City Council November 26, 1913, after a thorough investigation made by the city authorities of the Commonwealth Edison Company's books, gives a relatively lower schedule of rates for various kinds of electric service than any of the larger cities obtain by contract, except those being supplied by current generated by water power. The table below gives the relative retail electric lighting rates of electric companies in the largest cities, based upon $2\frac{1}{2}$ hours' use per day of the maximum demand, which is the average for Chicago conditions:

Retail Electric Lighting Rates—Cents per Kilowatt Hours

	New York	Chicago	Philadelphia	St. Louis	Boston	Cleveland	Baltimore
Rate	10.0	6.6	10.0	7.0*	10.0	7.2	7.3*
Min. monthly Bill	None	None	$1—except July and August	$.50	$9 per year	None	$12 per year
	Pittsburgh	Detroit	Buffalo	San Francisco	Milwaukee		
Rate	10.0	6.7	5.8*	6.7	6.9		
Min. monthly Bill	$.50	$.50	$12 per year	$.75	$.50		

* Current furnished by water power.

In all of the above cities carbon incandescent lamps are renewed free, except Buffalo and San Francisco.

(The above is based on 1 kilowatt load used 2½ hours per day.)

The two principal causes for these low rates in Chicago are the efficient generating units installed in the large central stations and the high load factor on the stations and system. The load factor has been materially increased by the sale of the power to the street surface and elevated railway lines.

During the year 1913, 929,000,000 kilowatt hours were generated by the Edison Company. The total annual expense of the company for the year was $10,858,343.26, consisting of $7,957,299.99 cash costs, $1,547,127.44 depreciation and $1,353,915.83 taxes and municipal compensation. This shows a total cost of approximately $1.17 per kilowatt hour generated and distributed into the lines during the year.

Gas and Gasoline Lighting

While many gas lamps are being replaced in Chicago by electric lamps each year, many gas lamps are replacing the uneconomical gasoline lamps in the outlying territory where the gas mains have been extended. The only expense to the city involved in extending gas services and erecting the gas posts is that for paving over the services. As this amounts to an average of less than $5 per lamp, a large saving is made by replacing the gasoline lamps with gas lamps where the gas mains are laid.

Gasoline lamps were contracted for this year at $30.24 per lamp per year, while the annual cost for the gas lamps is $20.85, consisting of $9.09 for gas at $0.80 per 1,000 cubic feet and $11.76 for the maintenance and repairs.

It will be noted from these figures that 43 per cent of the gas lighting cost is for gas alone, so that a 25 per cent reduction in our gas rate from 80 to 60 cents per 1,000 cubic feet would give about 11 per cent reduction on the total gas light cost, whereas, a 25 per cent reduction in the electrical current rate for arc lamps would mean less than 5 per cent reduction on the total arc lamp rate per year, as the electric energy cost is less than 19 per cent of the total cost.

What steps are necessary to properly utilize all good rate regulation work and improvements which have been accomplished in various cities?

It is my belief that the first and most important step to be taken is that of close coöperation between the various cities, in conjunction with concerted action for fair and reasonable utility rates, as is arranged for by this mayors' conference.

If Cleveland has the most economical water system, Philadelphia the gas lighting system and Chicago the arc lighting system, let us all know the reasons why this is the case, so that the methods used in obtaining good results along these various lines can be tried out and applied in all our cities.

A study of the local utility problems by the municipal authorities of one city in coöperation with those of other cities will prove, among other things, that water rates in many cities could be materially reduced by the installation of meters which would reduce the present misuse and loss of water; that underground metallic work, including pipes and cable sheath, which is being damaged by electrolysis today can be kept clear from damage if proper protective ordinances are passed and enforced; that more uniform and lower telephone, gas and electric light rates could be made in various cities if proper investigations were made of the public utility properties, and that statistics and information upon the methods used in solving such problems as sewage, undergrounding of wires, the continual tearing up of streets and the congestion of traffic in one city should aid all other cities in solving similar problems.

I further believe that the second step should be along lines of organizing national committees, which will work under the direction of the trustees of the National Utilities Bureau as organized, the object of these committees being to carry out the purpose of the bureau given in the program for this conference of American Mayors:

PURPOSE OF THE BUREAU

1. To serve as a national agency through which American cities may cooperate in exchanging data as to rates, service standards and cost factors in municipal utilities.

2. To advise cities as to the best plans and methods for their utility campaigns.

3. To publish and disseminate information pertaining to service standards, rates, franchises, public contracts, and any and all other matters of interest and value to the public, regarding the operation, construction, maintenance and regulation of public utilities.

4. To assist, upon request, in the proper and adequate presentation of the interests of the city and the public in hearings on utility matters before public service commissions or other regulative or judicial bodies.